Analytical Laboratory

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Order Summary Report

Order Number: **J13110436**

Project Name: WWTS FGD-Routine 2013

Customer Name(s): BIll K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: (Signature) Jason C **Date:** 1/6/2014

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013028681	BELEWS	22-Nov-13 9:49 AM	MC/TO	FGD Purge Eff
2013028682	BELEWS	22-Nov-13 9:50 AM	MC/TO	EQ Tank Eff
2013028683	BELEWS	22-Nov-13 9:55 AM	MC/TO	BioReactor 1 Inf
2013028684	BELEWS	22-Nov-13 9:55 AM	MC/TO	BioReactor 2 Inf
2013028685	BELEWS	22-Nov-13 10:00 AM	MC/TO	BioReactor 2 Eff
2013028686	BELEWS	22-Nov-13 10:00 AM	MC/TO	Filter Blk
2013028687	BELEWS	11-Nov-13 1:45 PM	DB	TRIP BLANK

7 Total Samples

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).	☑ Yes	☐ No
All Results are less than the laboratory reporting limits.	☐ Yes	☑ No
All laboratory QA/QC requirements are acceptable.	☑ Yes	☐ No

Report Sections Included:

- ☑ Job Summary Report
- ☑ Sample Identification
- ☑ Technical Validation of Data Package
- ☑ Analytical Laboratory Certificate of Analysis
- ☐ Analytical Laboratory QC Report
- ☑ Sub-contracted Laboratory Results
- ☐ Customer Specific Data Sheets, Reports, & Documentation
- ☐ Customer Database Entries
- ☑ Chain of Custody
- ☑ Electronic Data Deliverable (EDD) Sent Separatel

Reviewed By: DBA Account Date: 1/6/2014

Certificate of Laboratory Analysis

Order # J13110436

Site: FGD Purge Eff **Sample #: 2013028681**

Collection Date: 22-Nov-13 9:49 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**9.0**	mg-N/L		0.25	25	EPA 353.2	12/05/2013 13:55	TLINN
INORGANIC IONS BY IC								
Bromide	**130**	mg/L		5	50	EPA 300.0	12/02/2013 22:19	JAHERMA
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**8.10**	ug/L		5	100	EPA 245.1	12/06/2013 12:59	DKJOHN2
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**235**	mg/L		0.5	10	EPA 200.7	12/02/2013 13:24	MHH7131
DISSOLVED METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	12/09/2013 13:05	DJSULL1
Selenium (Se)	**73.9**	ug/L		10	10	EPA 200.8	12/09/2013 13:05	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**21.0**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Chromium (Cr)	**21.9**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Copper (Cu)	**10.6**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Nickel (Ni)	**157**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Selenium (Se)	**274**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
Zinc (Zn)	**49.9**	ug/L		10	10	EPA 200.8	12/06/2013 13:38	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Site: EQ Tank Eff **Sample #: 2013028682**

Collection Date: 22-Nov-13 9:50 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**7.85**	ug/L		2.5	50	EPA 245.1	12/06/2013 12:38	DKJOHN2
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**204**	mg/L		0.5	10	EPA 200.7	12/02/2013 13:29	MHH7131
DISSOLVED METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	12/09/2013 13:08	DJSULL1
Selenium (Se)	**57.4**	ug/L		10	10	EPA 200.8	12/09/2013 13:08	DJSULL1

Certificate of Laboratory Analysis

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Order # J13110436

Site: EQ Tank Eff **Sample #: 2013028682**

Collection Date: 22-Nov-13 9:50 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**17.6**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Chromium (Cr)	**18.8**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Nickel (Ni)	**106**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Selenium (Se)	**256**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1
Zinc (Zn)	**33.5**	ug/L		10	10	EPA 200.8	12/06/2013 13:41	DJSULL1

Site: BioReactor 1 Inf **Sample #: 2013028683**

Collection Date: 22-Nov-13 9:55 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**9.0**	mg-N/L		0.25	25	EPA 353.2	12/05/2013 13:56	TLINN
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**184**	mg/L		0.5	10	EPA 200.7	12/02/2013 13:33	MHH7131
DISSOLVED METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	12/09/2013 13:12	DJSULL1
Selenium (Se)	**67.1**	ug/L		10	10	EPA 200.8	12/09/2013 13:12	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Nickel (Ni)	**18.3**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Selenium (Se)	**82.1**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:45	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

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Order # J13110436

Site: BioReactor 2 Inf **Sample #: 2013028684**

Collection Date: 22-Nov-13 9:55 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**179**	mg/L		0.5	10	EPA 200.7	12/02/2013 13:37	MHH7131
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Nickel (Ni)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Selenium (Se)	**19.4**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	12/06/2013 13:48	DJSULL1

Site: BioReactor 2 Eff **Sample #: 2013028685**

Collection Date: 22-Nov-13 10:00 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**< 0.01**	mg-N/L		0.01	1	EPA 353.2	12/05/2013 13:57	TLINN
INORGANIC IONS BY IC								
Bromide	**87**	mg/L		5	50	EPA 300.0	12/02/2013 22:38	JAHERMA
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**182**	mg/L		0.5	10	EPA 200.7	12/02/2013 13:41	MHH7131
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Cadmium (Cd)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Chromium (Cr)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Copper (Cu)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Nickel (Ni)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Selenium (Se)	**6.63**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Silver (Ag)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1
Zinc (Zn)	**< 5**	ug/L		5	5	EPA 200.8	12/06/2013 13:52	DJSULL1

Certificate of Laboratory Analysis

Order # J13110436

Site: BioReactor 2 Eff — **Sample #: 2013028685**
Collection Date: 22-Nov-13 10:00 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C
TOTAL DISSOLVED SOLIDS								
TDS	**15000**	mg/L		25	1	SM2540C	12/02/2013 11:45	DSBAKE1

Site: Filter Blk — **Sample #: 2013028686**
Collection Date: 22-Nov-13 10:00 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	12/09/2013 13:20	DJSULL1

Site: TRIP BLANK — **Sample #: 2013028687**
Collection Date: 11-Nov-13 1:45 PM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**< 0.05**	mg/L		0.05	1	EPA 200.7	12/02/2013 13:00	MHH7131
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Cadmium (Cd)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Chromium (Cr)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Copper (Cu)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Nickel (Ni)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Silver (Ag)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1
Zinc (Zn)	**< 1**	ug/L		1	1	EPA 200.8	12/06/2013 13:10	DJSULL1

APPLIED SPECIATION AND CONSULTING, LLC

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December 11, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS# J13110436)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on November 26, 2013. The samples were received in a sealed cooler at -0.1°C on November 27, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS# J13110436)

December 11, 2013

1. Sample Reception

Three (3) aqueous samples were submitted for selenium speciation analysis on November 26, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on November 27, 2013 in a sealed container at -0.1°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on December 5, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on December 4, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. With the exception noted below, all quality control parameters associated with these samples were within acceptance limits.

The selenocyanate matrix spike and matrix spike duplicate (MS/MSD) recoveries were below the lower control limit of 75% (61.0% and 62.4%, respectively). The spiking solution also contained selenite, and the spike recoveries for selenite were elevated (120.8% and 121.2%, respectively). The low recoveries for selenocyanate correlate with the elevated recoveries of selenite, suggesting that the sample matrix induces species conversion. No species conversion was observed in the bracketing continuing calibration verification standards (CCVs), demonstrating that the applied method stabilizes these species in solution. Since the low recoveries observed for selenocyanate in the MS and MSD are therefore attributable to the sample matrix, no corrective actions were required. The reported results are deemed representative of the supplied samples and indicate that the spiked sample matrix is oxidizing in nature.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

Upon validating the data, the project manager at Applied Speciation and Consulting observed that all selenium speciation results for the client sample identified as FGD Purge Eff (LIMS ID: 2013028681) were non-detects. This is atypical for selenium speciation results associated with this client sample for this project. The original sample containers were examined, and the FGD Purge Eff sample liquid was completely clear, lacking any suspended solid material. This too is atypical, as the aqueous FGD samples received routinely contain some dark, solid material suspended in solution. The container for the BioReactor 1 Inf (LIMS ID: 2013028683) did contain some dark, solid material suspended in solution similar to the characteristic appearance observed for FGD Purge Eff samples.

The samples were logged in by sample reception staff according to the sample IDs provided on the sample containers.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
Contact: Jay Perkins
LIMS #J13110436

Date: December 11, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	ND (< 7.2)	ND (< 3.5)	ND (< 2.9)	ND (< 4.5)	ND (< 4.5)	0 (0)
BioReactor 1 Inf	0.122	20.5	41.5	ND (< 0.73)	ND (< 1.1)	ND (< 1.1)	0 (0)
BioReactor 2 Inf	0.0228	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0065	29.9	32.6	ND (< 0.73)	ND (< 1.1)	ND (< 1.1)	0 (0)

All results reflect the applied dilution and are reported in µg/L
NR = Analysis not requested
ND = Not detected at the applied dilution
SeCN = Selenocyanate
MeSe(IV) = Methylseleninic acid
SeMe = Selenomethionine
Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS
n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
Contact: Jay Perkins
LIMS #J13110436

Date: December 11, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	-0.0003	-0.0003	-0.0007	-0.0003	-0.0004	0.0002	0.0001	0.0006	-	-
Se(IV)	0.00	0.00	0.00	0.00	0.00	0.00	0.007	-	1.8	7.2
Se(VI)	0.00	0.00	0.00	0.00	0.00	0.00	0.003	-	0.86	3.5
SeCN	0.00	0.00	0.00	0.00	0.00	0.00	0.003	-	0.73	2.9
MeSe(IV)	0.00	0.00	0.00	0.00	0.00	0.00	0.005	-	1.1	4.5
SeMe	0.00	0.00	0.00	0.00	0.00	0.00	0.005	-	1.1	4.5

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1655	105.5
Se(IV)	LCS	4.79	4.71	98.5
Se(VI)	LCS	4.74	4.59	96.8
SeCN	LCS	4.46	4.35	97.6
MeSe(IV)	LCS	3.24	3.05	94.2
SeMe	LCS	4.66	4.48	96.1

Total Mercury & Selenium Speciation Results for Duke Energy
Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
Contact: Jay Perkins
LIMS #J13110436

Date: December 11, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	BioReactor 2 Eff	0.0065	0.0065	0.0065	0.0
Se(IV)	BioReactor 2 Eff	29.9	30.7	30.3	2.6
Se(VI)	BioReactor 2 Eff	32.64	32.07	32.36	1.8
SeCN	BioReactor 2 Eff	ND (< 0.73)	ND (< 0.73)	NC	NC
MeSe(IV)	BioReactor 2 Eff	ND (< 1.1)	ND (< 1.1)	NC	NC
SeMe	BioReactor 2 Eff	ND (< 1.1)	ND (< 1.1)	NC	NC

ND = Not detected at the applied dilution
NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	BioReactor 2 Eff	2.000	2.138	106.6	2.000	2.222	110.8	3.9
Se(IV)	BioReactor 2 Eff	1390	1709	120.8	1390	1715	121.2	0.4
Se(VI)	BioReactor 2 Eff	1261	1230	95.0	1261	1231	95.0	0.1
SeCN	BioReactor 2 Eff	1144	697.1	61.0*	1144	714.2	62.4*	2.4

*Low recovery is due to matrix induced species conversion. Please see narrative.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

DUKE ENERGY

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER# J13110436 | MATRIX: OTHER | Samples Originating From: NC SC

Logged By: BGeorge | Date & Time: 11/26/13 10:34

SAMPLE PROGRAM: Ground Water ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

AS&C
PO #650910

3.0 Cooler Temp (C)

[19]Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB.
COPY to CLIENT

[1]Project Name: Belews - FGD (WWTS @ Marshall & Belews Creek Steam Stn)		[2]Phone No:	
[2] Client: Bill Kennedy, Melonie Martin, Wayne Chapman		Use Project: WWTS FGD-Routine 2013	
[5]Business Unit: 20003	[6]Process: BMCEFGD	Mail Code:	
[8]Oper. Unit: BC00	[9]Res. Type:	[10]Reso. Center:	

[15]Preserv 1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None: 4 | 4 | 3,4 | 3,4 | 2,4 | | 4

Customer to complete all appropriate non-shaded areas.

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	[16]Analyses Required: TDS	Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - verify w (Important to place labels bottle back into both baggies)
20130286 81		FGD Purge Eff	11/22	0744	mL/TO				1	1	1	1		1
20130286 82		EQ Tank Eff.		0950	mL/TO					1	1			
20130286 83		BioReactor 1 Inf		0955	mL/TO					1**	1	1	1	1
20130286 84		BioReactor 2 Inf		0955	mL/TO					1**			1	
20130286 85		BioReactor 2 Eff	11/22	1000	mL/TO			1	1	1**		1	1	1
20130286 86		Filter Blk		1000	mL/TO						1			
20130286 87		Metals Trip Blk	11/13	1556	D.G.L.					1**				

Filtering of the Se is performed in the field please provide a filter blank too

1) Relinquished By	Date/Time 11/25/13 1300	2) Accepted By	Date/Time 11/26/13 10:36
3) Relinquished By	Date/Time	4) Accepted By	Date/Time
5)Relinquished By	Date/Time	6)Accepted By	Date/Time 11/27/13 1400 -0.1°C
7)Relinquished By	Date/Time	8)Accepted By	Date/Time
9)Seal/Locked By	Date/Time	10) Seal/Lock Opened By	Date/Time
11)Seal/Locked By	Date/Time	12)Seal/Lock Opened By	Date/Time

Comments

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS

[22]Requested Turnaround
24 Days ___
*7 Days ___
*48 Hr ___
*Other 14 days
* Add Cost Will Apply
12/4/13

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

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Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
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Analytical Laboratory Use Only

ORDER# J13110436 | MATRIX: OTHER | Samples Originating From NC___ SC___

Logged By: BGeorge | Date & Time: 11/26/13 10:34 | SAMPLE PROGRAM: Water___ Ground___ NPDES___ Drinking Water___ UST___ RCRA Waste___

Cooler Temp (C): 3.0

AS&C
PO #650910

[19]Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Customer must Complete

1)Project Name	Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)	2)Phone No:	
2) Client:	Bill Kennedy, Melonie Martin, Wayne Chapman	Use Project: WWTS FGD-Routine 2013	
5)Business Unit: 20003	6)Process: BMCEFGD	Mail Code:	
8)Oper. Unit: BC00	9)Res. Type:	10)Reso. Center:	

Customer to complete all appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

[15]Preserv.: 1=HCl 2=H_2SO_4 3=HNO_3 4=Ice 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS	Br (Dionex)	Metals* + Hg 245.1**	[15]Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
									4	4	3,4	3,4	2,4	4
20130286 81		FGD Purge Eff	11/22	0949	mC/TO				1	1	1	1		1
20130286 82		EQ Tank Eff.		0950	mC/TO					1	1			
20130286 83		BioReactor 1 Inf		0955	mC/TO					1**	1	1	1	1
20130286 84		BioReactor 2 Inf		0955	mC/TO					1**			1	
20130286 85		BioReactor 2 Eff	11/22	1000	mC/TO			1	1	1**		1	1	1
20130286 86		Filter Blk		1000	mC/TO						1			
20130286 87		Metals Trip Blk	11/11/13	1345	D Baker					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

Customer to complete appropriate columns to right

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

	Date/Time		Date/Time
1) Relinquished By	11/25/13 1300	2) Accepted By	11/26/13 10:36
3) Relinquished By	11/25/13 1345	4) Accepted By	
5)Relinquished By		6)Accepted By:	
7)Relinquished By		8)Accepted By:	
9)Seal/Locked By		10) Seal/Lock Opened By	
11)Seal/Locked By		12)Seal/Lock Opened By	

Comments

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround

21 Days ____
*7 Days ____
*48 Hr ____
*Other 14 days
* Add. Cost Will Apply